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REPORT

BY THE

EXAMINATION-COMMITTEE

ON THE

REPORT

BY THE

VISITORS OF PRIMARY EXAMINATIONS

(DR. WINDLE AND PROFESSOR J. CAMPBELL BROWN)

ON THE

EXAMINATION

IN

CHEMISTRY, PHYSICS, AND BIOLOGY,

OF THE

CONJOINT EXAMINING BOARD IN ENGLAND

OF THE

ROYAL COLLEGE OF PHYSICIANS OF LONDON

AND THE

ROYAL COLLEGE OF SURGEONS OF ENGLAND,

HELD IN JULY-AUGUST, 1902,

TOGETHER WITH

REMARKS BY THE BODIES INSPECTED.

(MAY, 1903.)

(Received by the General Medical Council on May 29, 1903,
and Adopted on July 15, 1903.)

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Note.

The names of the Examiners who conducted the Examinations dealt with in this *Report* were as follows .—

In Chemistry :—

Professor J. M. THOMSON.
Dr. H. FORSTER MORLEY.
Professor H. B. DIXON.
Dr. A. M. KELLAS.

In Elementary Biology :—

Mr. F. G. PARSONS.
Mr. H. WILLOUGHBY LYLE.
Mr. P. CHALMERS MITCHELL.
Dr. W. C. RIDEWOOD.

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I.—REPORT

BY THE

VISITORS ON THE EXAMINATION IN CHEMISTRY AND PHYSICS AND IN BIOLOGY OF THE CONJOINT EXAMINING BOARD IN ENGLAND.

GENERAL.

THE Examinations in (*a*) Elementary Biology and (*b*) Chemistry and Chemical Physics, which the GENERAL MEDICAL COUNCIL appointed us to inspect, commenced on Tuesday, July 29, and continued until the afternoon of Friday, August 1. Thursday, July 31, was, however, devoted to Practical Pharmacy, a subject which we were not asked to report upon. The Time Table for the parts of the Examination with which we were concerned was as follows:—

Tuesday, July 29.—2 to 5 P.M., Paper in Chemistry and Chemical Physics; 2.30 to 5.30 P.M., Oral Examination in Elementary Biology.

Wednesday, July 30.—2.30 to 5.30 P.M., the same continued.

Friday, August 1.—10.30 to 12.30 A.M., 2 to 4 P.M., Practical Examination in Chemistry.

We desire to express our sense of the extreme courtesy with which we were received by Mr. HALLETT, the Secretary of the Board, and by the Examiners. Every possible facility was afforded to us for studying the Examination, and every item of information for which we asked was at once placed at our disposal.

ELEMENTARY BIOLOGY.

METHOD OF EXAMINATION.

The Examination in this subject is conducted in accordance with a schedule, a copy of which is appended to this *Report.* It is conducted entirely by the oral method, no paper being set and no practical work required from the Candidates. There are two tables in the Examination room, at each of which two Examiners preside. Each Candidate is under examination for fifteen minutes, at the end of which period a bell rings and the Examination comes to an end, even in the middle of a question or answer. The Examiners take it in turns to put questions to the Candidates, and the Examiner who is not thus engaged makes notes, on a special form, of the main subjects examined upon. At the end of the examination of each Candidate these notes are referred to, a mark agreed upon, and his fate decided. The Candidates are known only by numbers, and we understand that arrangements are made by the Secretary, when deciding the order and tables of Candidates, which prevent any Student being examined by his own teacher. Of the order and organisation we cannot speak too highly. Everything worked by the clock and went like clockwork.

On the tables were microscopes, dissections, mounted and unmounted, skeletons, &c., and the Examination was almost entirely conducted on these objects. Amongst the specimens shown under the microscopes were sections of leaves and stems, of hydra and lumbricus, an ovum, frog's blood, bacteria, &c. Amongst the mounted specimens were various dissections of the dog-fish, including the brain and the vascular system, dissections of the frog and the earthworm. It is hardly necessary to say that all these were first-rate specimens. Of unmounted specimens we noticed skulls of the dog-fish and frog, portions of the skeletons of both these forms, the ovisac of the dog-fish, &c.

As the Candidates to be examined are not separated from those who have yet to undergo examination, it is obvious that a constant change of specimens is required if later Candidates are not to profit by the experience of those who preceded them.

The Examiners are fully alive to this fact, and the objects under the microscopes were constantly changed, whilst the larger objects submitted to the Candidates were varied frequently; so that, in our opinion, no harm whatsoever arose from the fact that the Candidates to come in were not secluded from the others who had been through the Examination.

Amongst the questions put to Candidates, the following may be mentioned as evidence of the range of the Examination:—Stomata, their position, nature and function; fibro-vascular bundles, their composition, difference of arrangement in mono- and di-cotyledons; bordered pits, where found; composition of starch, reagents for detecting same, and other constituents of plants; cellulose; chlorophyll, its functions; yeast, its life-history; bacteria, varieties, relation to decomposition; elementary facts of plant physiology. Skull of frog, bones forming it; section of dog-fish, parts seen; foramina in skull of dog-fish; cranial nerves of same, and of frog; circulation in these forms; renal and hepatic portal systems; hibernation of frog, fat-bodies; hydra and vorticella, methods of reproduction; maturation of ovum; segmentation (elementary knowledge only); formation of primitive layers of the embryo, objects derived from same; blood of frog, hæmoglobin, function of same.

From the above list, it will be seen that all the subjects included in the Syllabus were dealt with in the course of the Examination.

RESULTS.

Sixty-five Candidates presented themselves for examination, of whom forty-five passed and twenty were referred. Of these, forty-nine came from medical schools, of whom thirty-two passed and seventeen were referred; while sixteen came from other institutions, of whom thirteen passed and three were referred.

In percentages these results work out as follows:—

		Passed	Referred
All Candidates ...	...	67 per cent.	33 per cent.
Medical Schools ...	...	65 ,,	35 ,,
Other Institutions	...	81 ,,	19 ,,

GENERAL REMARKS ON THE CONDUCT OF THE EXAMINATION.

We were informed by the Examiners that the method of conducting the Examination was laid down for them, and that their duty was to carry out the instructions given to them to the best of their ability. Hence we reserve our remarks on the value of the Examination for another section of this *Report*, and here set down our opinion of the conduct of the Examination under the conditions laid down for the Examiners. From this point of view, and with the limitation expressed, we have nothing but praise to give. The arrangements of the Examination were admirable, there were plenty of specimens, microscopic and otherwise, and the questions put were well calculated to discover the knowledge or expose the ignorance of the Candidates. so far as an Oral Examination is capable of achieving such ends. We noted that the Examiners were content with a very modest standard of knowledge in a Candidate, but in this they were no doubt justified by their experience of the state of ignorance in which most Candidates seem to present themselves. Nothing struck us more forcibly in the course of our inspection than the fact that scarcely a single Candidate presented himself who could be said to have exhibited the possession of any real grasp of the elementary principles of the subject. When it was a question of naming the bones in the skull of the frog, of the parts of the brain of the dog-fish, or of the foramina in its skull, or such like matters, easily to be crammed up, the answers often came glibly enough. But in other matters, even of a simple nature, it was extraordinary to see the ignorance of the Candidates. Few, if any, seemed to have made, stained, and mounted preparations for themselves, and some did not even know the names of the staining materials. Again, the names and uses of the different parts of the microscope seemed to be wholly unknown to many of the Candidates. Three of them, coming closely one after the other, were unable to give the name of the coarse adjustment. The uses of the draw-tube, diaphragm, and the two faces of the mirror were unknown to most Students examined on this topic. Here we may remark, parenthetically, that, if the course in Biology is to be of any service as a preparation for Physiological study, it would seem as if an elementary acquaintance with the parts and use of the microscope is one of the pieces of knowledge which might well be expected from Students.

To return to the Examination, as we have already remarked, it seemed as if the Candidates, for the most part, had failed to obtain any clear idea of the simplest general principles of Biology from the instruction which they had received. We find it difficult to understand why some, the depths of whose ignorance were almost unfathomable, were ever allowed to present themselves for examination. We mention these points because we believe that they wholly justify the Examiners in adopting the standard for a pass which they are prepared to accept. In order that any reasonable number of Students should succeed in passing, things being as they are, a low standard of knowledge must necessarily be accepted. It is fair to add that we were informed that the average knowledge of men presenting themselves for the Examination in April was distinctly higher than that of those whom we saw. This, no doubt, is due to the fact that the April Examination, being held at the termination of the winter course in Biology, the better Students present themselves thereat. The worse Students, no doubt, find it easier to get through at an Examination when the general standard of answering is lower.

We cannot conclude this section of our *Report* without expressing our admiration for the manner in which the Examiners carried out the difficult task of endeavouring to extract the best that could be got from a body of Students well calculated to try the patience of those appointed to test their knowledge.

REMARKS ON THE VALUE OF THE EXAMINATION.

(*a*) SYLLABUS.

We are inclined to think that better results would be obtained if a much more complete knowledge of two or three types, with their development and life-history, and a short

Practical Examination on the preparation and staining of a microscopical specimen, were demanded, even if this involved, as it probably would, a curtailment of the Syllabus by the omission of some of the types now demanded. At present a smattering of knowledge—it is no more—is all that Students can be expected to have obtained, and to instil into the minds of Medical Students, at the outset of their career, the idea that a smattering of any subject is all that they should strive for seems to us to be a very false policy.

(*b*) STANDARD.

In the printed instructions to Examiners it is laid down that four out of a possible ten marks shall be the lowest figure on which a pass is obtainable. This is a respectable percentage, but then it must be borne in mind that there is no such thing as an absolute percentage in Examinations. Here, as in every other place, in subjects in which it is impossible to mark with the accuracy with which, for example, an arithmetic paper can be marked, the value of any percentage fluctuates—the pass-mark *is* a pass-mark, and is given to the man whom the Examiners deem worthy of passing, without any precise ratio to the sum of knowledge respecting the subject being assigned to it. In other words, 40 per cent. does not mean 40 per cent. of the sum of human knowledge on the subject, but 40 per cent. of such knowledge as experience teaches the Examiners that Candidates may reasonably be expected to possess. Hence 40 per cent. in one Examination may be very different from 40 per cent. in another—that is, there is no such thing as an absolute 40 per cent. We regard the 40 per cent. exacted at this Examination as a rather low 40 per cent.; but, in saying this, we wish to make it quite clear—(i) that we have not been able to compare this Examination with any others of its own class, so that we are really contrasting it with an ideal standard existing in our own minds; and, (ii) that we believe the Examiners to be abundantly justified, under the existing conditions, in limiting their requirements, as they have done.

(*c*) METHOD OF EXAMINATION.

One of the points to which we specially directed our attention was the question as to whether the Examination was one by means of which it was possible to judge whether a Candidate had been properly prepared, with due attention to practical work, or whether his knowledge was merely the result of cram. We give the Examiners every credit for making all possible efforts, in their examination, to elicit this important piece of information in connection with each Candidate, but we are bound to report that, in our opinion, under the system of submitting the Candidate only to an Oral Examination, it is not possible to judge whether the instruction which he has received has been satisfactorily given. No doubt, within a given scope of answers, an Examiner does find out whether a man knows anything or not, better by an Oral than by a Written Examination. But there is this advantage in a Written Examination, that the Examiner gets two hours of answers from a Candidate without wasting more than a few minutes of his own time in determining their value. Moreover, the written answers, if the questions are skilfully prepared, do elicit information as to whether the Candidate has got a clear idea of the principles which have been laid down in the course of his instruction. We believe that some paper work might reasonably be demanded from Candidates, for the reasons above assigned, and for this further reason, that we think that Medical Students cannot too early begin practising the method of arranging their knowledge and setting it down clearly and comprehensibly. We believe that this is just where most Students fail, and fail because they have never been properly taught this simple and most important branch of knowledge at school. The sooner, then, that they begin to recognise the necessity of being able to do written answers, the better, in our opinion, will be the result in its effect upon their future career. But we do not regard the written part as being of equal value with either the practical or the oral portions of an Examination on such a subject as Biology. We are strongly of opinion that the omission of any Practical Examination is a weakness in the particular instance which we are considering. We do not feel that it is within our province to make definite suggestions as to how this Practical Examination should be carried out, but we might suggest that the cutting or at least the staining and mounting of a microscopic section would afford a considerable amount of information as to how a Candidate had been taught, and that such a test is one which might not unreasonably be demanded in an Examination of this character. Of course, we are prepared to admit that, in making these suggestions, we are proposing that the character of the Examination shall be wholly altered, and that it shall be made distinctly more severe. This is true, but surely, if the subject is to be taken up at all, it is worth while dealing with it in a substantial manner. It is not worth while having a course and Examinations in Biology, unless the subject is to be of real value to Students in their after-studies. And, we repeat, to encourage Students to believe that a superficial knowledge—a smattering—of any subject is all that can be expected from them is a false step, uneducational, and likely to do serious injury to them in their future career. Without demanding deep morphological knowledge, the Examination should at least provide that the fundamental laws of the subject had been clearly brought before the Students and that the knowledge with which they had been furnished had been adequately and intelligently assimilated. We cannot conceive that the few half-digested facts which passed for a knowledge of Biology in the case of most of the Candidates at whose Examination we were present can possibly be of any service to them.

SUMMARY.

(i) Given the Syllabus and the method of conducting the Examination laid down for the Examiners, the conduct of the Examination is all that could be desired, and the standard exacted is apparently as high as can be obtained from Candidates so imperfectly trained as those at whose Examination we were present.

(ii) The Examination is not one capable of eliciting whether a Candidate has been properly taught or has been crammed, but this, in our opinion, is due to defects inherent in its method, and not in any way to the manner in which the Examination, as designed, is carried out.

CHEMISTRY AND PHYSICS.

The Examination was partly written and oral and partly practical. In the written portion three hours were allowed for answering from four to six questions. For the practical, one simple salt or substance was given for analysis and one simple salt was required to be made and shown up in characteristic form and good condition. Candidates were required to write an account of the work they had done. Regulations require that not less than thirty minutes shall be allowed for the practical portion; actually the time allowed was two hours.

Regulations provide that the maximum of marks obtainable is 5 for the written and 5 for the practical portion of the Examination, and that 2 marks shall be the minimum to pass in either, but the sum of the two taken together shall not be less than 5 marks; that is to say, the minimum to pass is 50 per cent. of full value of the whole Chemistry and Physics Examination, while less than 40 per cent. in either written or practical causes rejection, even if the total of the two is more than 50 per cent.

RESULTS.

The number of Candidates presenting themselves for examination was 109; of these, 26 had been previously examined and had been referred to their studies for a further period. Of the whole number, 73 (or 67 per cent.) passed, and 36 (or 33 per cent.) failed to satisfy the Examiners and were "referred." Ninety-five of the Candidates came from Medical Schools, of whom 66 (or 69·5 per cent.) passed, and 29 (or 30·5 per cent.) failed. Fourteen Candidates came from other Institutions, of whom 7 (or 50 per cent.) passed, and 7 (or 50 per cent.) failed.

GENERAL REMARKS ON THE CONDUCT OF THE EXAMINATION.

The method of conducting and marking is laid down for the Examiners by regulations. The paper includes only details given in the schedule or synopsis, of which we append a copy. We also append a copy of the paper, which consists of eight questions, of which four at least must be answered, and not more than six may be attempted. This gives a fairness as between Candidates from different schools.

There were four acting Examiners, and each paper was read by two of these Examiners. As it is quite impossible to mark written papers on a scale of full value—5, the Examiners marked on a scale of 300 or some such number, and afterwards translated the results into the official marks. Thus a Candidate getting under 27 per cent. of the possible value would get the official mark 0. Those getting from 27 to 40 per cent. would get 1, those getting from 40 to 60 per cent. would get 2, and so on, while those getting upwards of 87 per cent. would get the full marks—5. When the value of any paper was very near 40 per cent., whether below or above, the Candidate was subjected to an Oral Examination in presence of two Examiners, to determine whether he ought to pass or not, and he was then marked 2 or 1 accordingly. No other Candidates were subjected to an Oral Examination.

In the Practical Examination, all Examiners were present, with a number of invigilators; and it was conducted in such a way as, in our opinion, to prevent collusion or copying of any kind. For analysis, or rather testing, each Candidate received one simple salt, such as barium nitrate, mercuric chloride, or cream of tartar. Three marks were allowed for a correct result with confirmation and a satisfactory report. For preparation, such simple substances as potassium nitrate from potassium carbonate, or copper sulphate from copper oxide were set. Simple though such a preparation is, it is, in our opinion, the most efficient and valuable part of the Examination, and we regret that no more marks than 2 out of the 5 official full marks were allotted to it. At the close of the Examination two

Examiners went round the benches, examined the specimens, and recorded the marks. A crystalline characteristic product, in fair quantity and pure, was required in order to gain the 2 marks.

The procedure was very kindly explained to us, at every stage, with great fulness, by the Examiners, to whom we are indebted for their courtesy. We have seen the marks, read most of the papers, witnessed the Oral Examinations, the practical work, and the marking of the results; and we do not think that any Examiners could carry out the regulations with more scrupulous care, precision, and fairness than was observed at this Examination.

REMARKS ON THE EXAMINATION.

(*a*) The Syllabus or Synopsis.

The Syllabus is an extraordinary one, defective alike in matter and arrangement. It is divided into five sections:—Physics, Inorganic Chemistry, Metals, Organic Chemistry, and Practical Chemistry.

The Physics section is the most defective. For example—Gas laws are omitted, while the relation of Heat to Work is included, which might well be omitted from a Medical Examination. The paragraph on Electricity is not well expressed, and its meaning can sometimes only be guessed; while there is no mention of Light, although an acquaintance with the laws of refraction and reflexion is absolutely necessary to a Medical Student who will use both microscope and spectroscope.

We are informed that next year an amended Syllabus is to be adopted which meets many of our objections. Some acquaintance with the mechanical powers is also essential in order to understand the bones and muscles of the human frame.

As examples in the Chemistry portion of the Syllabus, we may mention that borax and boric acid are classed under Metals; while the Student is not expected to be aware of the existence of lithia, tin, chromates, bleaching powder, ethers, uric acid, and cacodyl. All these he will frequently hear of in his subsequent life.

This Syllabus is not a private direction for the Examiners; it is for the guidance of students and teachers. It does not indicate the principles which are to be taught, leaving it to the teacher to choose his details as illustrations, but it gives such an amount of detail as leads teachers and students alike to think that nothing need be known which is not included. As examples of the results of teaching on the lines of the practical section, we may mention that it is impossible to impart effective knowledge of arsenic without teaching also cadmium and tin, both of which are excluded, while arsenic is included. A teacher will either teach cadmium and tin, in which case the Syllabus is useless, or he will say nothing about these, in which case the Syllabus is mischievous, because it prevents a Student from knowing even arsenic. Phosphate of iron is mentioned. There are two. The Syllabus does not say which is meant, but the Student is not to know how to prepare more than one. In the present Examination it was evident that some Candidates knew one and some the other, but not both; and in most cases the one which they did not know was the one which was set.

(*b*) The Papers.

The theoretical paper founded on this Syllabus gives two questions on Physics, only one of which need be answered to the extent of 40 per cent. of its full value. There was no question on heat, and necessarily nothing on lenses or prisms, nor on the lever. There were three questions on Inorganic Chemistry (including the metals), of which one must be answered. These included some portions of questions, in answering which a knowledge of chemical principles would be displayed, but it was not necessary to answer these portions in order to pass on two of the questions. There were three questions on Organic Chemistry, but it was not necessary to answer more than one.

An example of the way this paper might be answered under the regulations is sketched as follows: The Candidate may answer six questions, and then must make 40 per cent. of their value; or he may answer only four questions, and then he must make 60 per cent. of the value of these four. The Candidate might choose the first question only in Physics, give details of one example of a substance whose purity is determined by its specific gravity, and of another by its colour or its boiling point, and be entirely ignorant of the laws of Heat and of Gases and know absolutely nothing about either Light or Electricity. He might then answer two questions in Section II, describing the preparation and properties of the two chief oxides of sulphur, explaining how sulphurous and sulphuric acids result from their combination with water; he might describe how barium sulphate results from the addition of a sulphate to barium chloride; copper sulphate by boiling copper in sulphuric acid, and red lead by roasting litharge, and be totally unacquainted with the elementary principles of Chemistry. He might finally write out from memory the formulæ:—

	Empirical	Molecular	Graphic
Acetic Acid... ...	CH_2O	$C_2H_4O_2$	CH_3COOH
Oxalic Acid ...	CHO_2	$C_2H_2O_4$	$COOH$ $COOH$
Benzoic Acid ...	$C_7H_6O_2$	$C_7H_6O_2$	C_6H_5COOH,

state that oxalic acid when heated with sulphuric acid breaks up into $CO + CO_2 + H_2O$, whereas when heated with glycerine it splits into HCOOH (formic acid) and H_2O, and be absolutely ignorant of Organic Chemistry. Yet the Examiners would be obliged by the regulations to pass him.

In order to make the Examination efficient, accepting the low standard adopted, it would be necessary to set three questions each in Physics, Inorganic Chemistry, and Organic Chemistry, and make it compulsory to answer two questions in each section. Three hours would be ample time for the six questions.

(c) THE STANDARD.

The standard of the questions set is a low one compared with other Examinations with which we are acquainted. The Candidates were so badly prepared that a higher standard would have rejected the majority of them. On the other hand, the minimum 50 per cent. marks required on the average of the written and practical is higher than is usual in a Chemistry Pass Examination. The idea evidently is to make the questions easy, and to require some of them to be answered well. This is a good principle, if the questions demanded were not so few, and contained so little of scientific principles that a Candidate might very well pass—and does pass—with only an empirical knowledge of a few preliminary facts crammed up from a book or a teacher and with no understanding of elementary principles.

We watched the Oral Examination of several men who made very close upon 40 per cent. of marks on the written paper, and who therefore very nearly passed. Most of them showed an absolute ignorance of the subject, and they were very properly "referred." Very few bettered their position and were allowed to pass. This Examination was conducted in an admirable and painstaking way; but on looking into details we were convinced that Candidates could easily make such a higher percentage of marks as would pass them without demur, and yet know no more really of the subject than those whom we saw rejected.

The standard of the Practical Examination is again a low one. The preparation of a salt, as the second part of this Examination is conducted, is an excellent test of knowledge, simple though the preparation is. But the marks allotted to it are only 2, while 3 marks are allotted to the testing of one simple salt. This latter is of no value as an Examination test, it is usually done "by rule of thumb"; the teaching of simple testing imparts no knowledge of Analysis, although it is misappropriately called Analysis, and is of extremely little value to the Student in his future studies and practice. To be of any value, either educationally or practically, Analysis must be so learned as to enable a Student, to some extent at least, to separate one thing from another. If a mixture of two metallic oxides were given in place of a simple salt, the Examination would not occupy more than one additional hour, while the teaching need not occupy longer time, only it would have to be carried on by a method which would impart some real knowledge, and would make impossible the cramming up of a number of routine empirical tests, which evidently was all that too many of the Candidates had done.

Throughout the whole Examination we were surprised to see that some of the Candidates knew absolutely nothing; many knew almost nothing. They ought not to have been allowed to come up for examination to waste Examiners' time. Their teachers must have known these Candidates were ignorant and unfit to commence the study of Physiology and professional subjects, although they may have put in the number of formal attendances required by regulations.

SUMMARY.

1. The Examination is conducted on the lines of the Syllabus and regulations in an efficient, fair, and painstaking manner.

2. The standard is a low one. The Physics portion of the Examination amounts to nothing, while the Chemistry portion does not afford any assurance that knowledge has been acquired of such a kind as will fit a Student to commence the study of Physiology and enable him to understand his reading and acquire a wider knowledge in after-life. The main portion of the Practical Examination is empirical and not scientific, and is no test either of sound principles or of practical efficiency, especially in the absence of any guarantee that a Student has performed efficiently such an amount of experimental work as will give him a grasp of Theory from the practical side.

3. The average degree of training displayed by the Candidates was far too low.

If the object of a preliminary training in Science is, as it ought to be, to secure a knowledge of principles and especially the power and habit of acquiring knowledge from observation and experiment, so that the Student may be fit to commence the study of Physiology and to understand his future reading, the Examination fails to secure this object. If the object is to impart those facts which a Medical man will make use of, then the Examination secures the acquisition of only a very small fraction of these facts and only in an empirical and unintelligent way.

4. The Syllabus, the details of the paper, the plan of the first and principal part of the Practical Examination are at fault, and especially the absence of any guarantee of sufficient preparation for the Examinations.

J. CAMPBELL BROWN.
BERTRAM C. A. WINDLE.

August 23, 1902.

SYNOPSES.

FIRST EXAMINATION.

CHEMISTRY, PHYSICS IN RELATION TO CHEMISTRY, AND PRACTICAL CHEMISTRY.

PHYSICS.

MATTER.—Solution and Mixture. Diffusion of Gases and Liquids. Dialysis. Osmosis.

WEIGHT.—*Relative Weight* (Specific Gravity).—Atmospheric Pressure. Air-pump. Barometer. Boyle's Law.

HEAT.—Temperature. Thermometers. Expansion of Gases. Heat of Evaporation. Pressure of Vapours. Boiling-point. Dew-point. Hygrometers. Conduction, Radiation, and Convection. Calorimeter. Relation of Heat to Work. Specific Heat. Heat of Combustion.

ELECTRICITY.—(*a*) *Frictional Electricity*.—The two Electrical States. Conduction. Insulation. Potential. Quantity. (*b*) *Galvanic Electricity*.—Constant Currents. Simple forms of Batteries. Induced Currents.

INORGANIC CHEMISTRY.

Elements.—Mechanical Mixture. Chemical Compounds. Laws of Chemical Combination. Atomic Theory. Meaning and Use of Chemical Symbols.

Hydrogen.—Units of Weight and Volume.

Oxygen.—Natural Occurrence. Ozone. Combustion. Respiration. Oxidation and Reduction. Oxides. Bases. Acids. Salts.

Water.—Composition and Properties. Composition of Water by volume. Rain-, River-, and Spring-water. Properties of Hard and Soft Waters.

Nitrogen.—The Atmosphere. Methods of determining its composition.

Ammonia.—Composition by volume. Oxides of Nitrogen. Nitric Acid. General characters of Nitrates and Nitrites.

Carbon.—Allotropic forms. Carbon dioxide. Carbonates. Carbon monoxide.

Halogens. Chlorine.—Hydrochloric Acid. Composition by volume. Hypochlorous Acid. Sodium Hypochlorite. Potassium Chlorate.

Bromine. Iodine.—Hydrobromic and Hydriodic Acids.

Sulphur.—Allotropic forms. Hydrogen Sulphide. Sulphur dioxide and trioxide. Sulphurous and Sulphuric Acids. General characters of Sulphates and Sulphites. Sodium Thiosulphate.

Phosphorus.—Allotropic forms. Phosphorus pentoxide. Ortho-phosphoric Acid. Phosphoretted Hydrogen.

METALS.

The following Metals with their compounds, as enumerated below:—

(*a*) Sodium, Potassium. (*b*) Calcium, Barium. (*c*) Magnesium, Zinc. (*d*) Aluminium. (*e*) Manganese, Iron. (*f*) Silver, Copper, Lead, Mercury. (*g*) Arsenic, Antimony, Bismuth.

Borax and Boric Acid.

Chlorides of the Metals already specified.

Bromides of Sodium, Potassium, Ammonium.

Iodides of Potassium, Iron, Mercury.

Oxides of the Metals already specified.

Sulphides of Sodium, Potassium, Ammonium, Zinc, Manganese, Iron, Silver, Copper, Lead, Mercury, Arsenic, Antimony, Bismuth.

Carbonates of Sodium, Potassium, Calcium, Magnesium, Iron, Lead.

Sulphates of Sodium, Potassium, Calcium, Barium, Magnesium, Zinc, Aluminium (Alum), Iron, Manganese, Copper, Lead.

Nitrates of Sodium, Potassium, Ammonium, Barium, Bismuth, Mercury, and Silver.

Orthophosphates of Sodium. Microcosmic Salt. Ammonio-magnesium Phosphate. Bone Phosphate. Acid Calcium Phosphate.

Potassium permanganate.

ORGANIC CHEMISTRY.

Ultimate Organic Analysis as regards C, H, and N. Determination of empirical formulæ, and molecular weight.

Hydrocarbons.—Homologous Series, as illustrated by the Paraffins. Methane (Marsh-Gas). Coal-Gas. Chloroform. Iodoform.

Alcohols.—Methyl. Ethyl. Acetic Aldehyde. Chloral. Formic and Acetic Acids. Acetates of Sodium, Ammonium, Potassium, and Lead.

Cyanogen.—Hydrocyanic Acid. Cyanides. Cyanates. Urea.

Palmitic, Oleic, and Stearic Acids.

Lactic, Oxalic, Tartaric, and Citric Acids.

Glycerine.—Constitution of Fats. Saponification.

Carbohydrates.—Grape, Cane, and Milk Sugar. Fermentation. Dextrin. Starch. Cellulin.

Benzene.—Phenol. Benzoic and Salicylic Acids.

PRACTICAL CHEMISTRY.

Identification of substances included in the following lists :—

INORGANIC.

METALS.—Sodium, Potassium, Ammonium, Calcium, Barium, Magnesium, Zinc, Iron, Aluminium, Copper, Silver, Lead, Mercury, Bismuth, Antimony, Arsenic.

ACIDS.—Hydrochloric, Hydrobromic, Hydriodic, Nitric, Carbonic, Sulphuric, Phosphoric.

The Metals may be present as metal, oxide, sulphide, or as a simple salt. The Acids Hydrochloric, Nitric, Sulphuric may be present in the free state.

ORGANIC.

Acetic, Oxalic, Tartaric, and Hydrocyanic Acids, and their salts with Potassium, Sodium, and Ammonium. Cane and Grape Sugar. Urea.

Candidates will be required to give equations illustrating the chemical reactions involved in testing for the above substances, and, if requested, to explain the same.

Preparation of one of the following compounds :—

Chloride of Sodium, of Ammonium, or of Lead.
Iodide of Lead or of Mercury.
Oxide of Copper or of Mercury.
Hydroxide of Sodium or of Copper.
Carbonate of Sodium, of Calcium, of Magnesium, or of Bismuth.
Oxalate of Ammonium.
Oxalate of Urea.
Nitrate of Potassium, of Barium, or of Lead.
Phosphate of Calcium or of Iron.
Sulphate of Sodium, of Calcium, of Magnesium, of Zinc, or of Copper.

Candidates will be required to exhibit to the Examiners the preparations which they have made, and to represent by equations the reactions involved.

ELEMENTARY BIOLOGY.

[*No Written Paper, nor Practical Examination.*]

Candidates will be expected to show a practical acquaintance with the following topics :—

1. The Chemical composition and properties of Protoplasm; the structure and properties of Cells; Cell-division; the general outlines of the Varieties of Cell-structure in the Tissues of Animals and Plants.

2. The structure and life-history of *Amœba*, *Vorticella*, *Protococcus*, and *Spirogyra* as illustrative of :—

(*a*) The differences between Plants and Animals.

(*b*) The general phenomena of the Life-history of Low Organisms.

3. The structure and mode of life of Saccharomyces and Bacteria; Fermentation; Putrefaction; modes of spread of Bacteria.

4. The relations between Multicellular and Unicellular Animals, as illustrated by a comparison of the structure, physiology, and life-history of *Hydra* and *Amœba.*

5. The *Cœlomata-Invertebrata*, as illustrated by the anatomy of *Lumbricus.*

6. The *Cœlomata-Vertebrata*, as illustrated by a comparison of the general characters of the skeleton, and of the digestive, circulatory, respiratory, genito-urinary, and nervous systems of the Dogfish and the Frog.

7. The structure of Ova and Spermatozoa; Fertilization; the early stages of Development; the formation of the Segmentation-cavity, of the Gastrula, Archenteron, and Cœlom, and of the Epiblast, Mesoblast, and Hypoblast, with an enumeration of the chief systems of organs derived from the three layers in a Vertebrate.

EXAMINING BOARD IN ENGLAND.

REGULATIONS—1st January, 1892.

Five Years' Curriculum.

FIRST EXAMINATION.

Subjects	Time	Marks		Marks to Pass
		Max.	Min.	
Chemistry, &c., Written...	3 hours	5	2	5
,, Practical (not less than)	30 minutes	5	2	
Practical Pharmacy, Oral	10 minutes	10	4	4
Elementary Biology, Oral	15 minutes	10	4	4

N.B.—*All papers must be read by two Examiners. The Oral Examinations must be conducted in the presence of two Examiners. The Examiners taking part in the Examination in Chemistry must be present during the Practical Examination.*

EXAMINING BOARD IN ENGLAND BY THE ROYAL COLLEGE OF PHYSICIANS OF LONDON AND THE ROYAL COLLEGE OF SURGEONS OF ENGLAND.

1. For qualitative analysis.

Write a concise account of the tests you have employed and express the chemical changes by equations.

(crystalline)

2. Prepare a pure and dry specimen of ____________________

from ____________________

Write a concise account of the process you have employed and express the chemical changes by equations.

Label and leave on the bench the specimens you have prepared.

EXAMINING BOARD IN ENGLAND BY THE ROYAL COLLEGE OF PHYSICIANS OF LONDON AND THE ROYAL COLLEGE OF SURGEONS OF ENGLAND.

FIRST EXAMINATION.

PART I.

CHEMISTRY, INCLUDING CHEMICAL PHYSICS.

TUESDAY, JULY 29, 1902.

From 2 to 5 o'clock P.M.

Candidates must answer at least FOUR *questions and not more than* SIX. *At least* ONE *question in each Section must be answered. Candidates unable to answer* at least FOUR *questions must report the fact to the Presiding Examiner, and are not allowed to proceed with their Examination.*

In Sections II and III, Equations should be given where possible.

SECTION I.

CHEMICAL PHYSICS.

1. The purity of a given Element or Compound is frequently determined by a study of its physical properties. Mention three properties, which can be made use of in this manner, and give an example in each case

2. Describe Bunsen's or Grove's Galvanic Cell. What advantage, if any, is obtained by increasing the size of the cell? What happens when a current from a battery of such cells is passed (*a*) through dilute Sulphuric Acid by Platinum electrodes, (*b*) through an aqueous solution of Copper Sulphate by Copper electrodes?

SECTION II.

INORGANIC CHEMISTRY.

3. Describe the preparation and properties of the substances represented by the formulæ SO_2 and SO_3. State whether a new compound is formed in each case when these substances are dissolved in water, and give reasons for your answer.

4. How would you prepare:—(*a*) Barium Sulphate from Barium Chloride; (*b*) Barium Chloride from Barium Sulphate; (*c*) Copper Sulphate from Copper; (*d*) Red Lead from Lead Monoxide (litharge); (*e*) Zinc Sulphide from Zinc?

5. Elements have been divided into metals and non-metals. In which group would you place the following elements:—(*a*) Sodium, (*b*) Chlorine, (*c*) Arsenic, (*d*) Phosphorus, (*e*) Manganese? Give reasons in each case.

SECTIONS III.

ORGANIC CHEMISTRY.

6. Explain the meaning of the term "homologous series," and give examples showing resemblances between members of such a series.

7. Give the empirical, molecular, and graphic formulæ of the following substances:—(*a*) Acetic Acid, (*b*) Oxalic Acid, (*c*) Lactic Acid, (*d*) Benzoic Acid. What happens when Oxalic Acid is heated (*a*) alone, (*b*) with strong Sulphuric Acid, (*c*) with Glycerine?

8. Describe the preparation of:—(*a*) Glacial Acetic Acid from vinegar; (*b*) Stearic Acid from beef fat; (*c*) Tartaric Acid from Argol (crude cream of tartar); (*d*) Lactic Acid from milk.

NOTE.—*This paper applies also to Candidates for the Licence of the Royal College of Physicians of London.*

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II.—REMARKS

BY THE

BODIES INSPECTED.

(*a*) By the Royal College of Physicians of London.

Royal College of Physicians,
London, S.W.:
April 7, 1903.

Dear Sir,—Referring to your letter of October 7 last, forwarding for the consideration of this College a *Report* by the Visitor and Inspector of the General Medical Council on the Examinations of the Conjoint Board in England in Chemistry, Physics and Biology, held in July and August last, and requesting that the College would forward to the Council such observations and remarks thereon as it might think necessary; I am now instructed by the College to reply as follows:—

> The College deems it inexpedient to adopt any detailed comments on the *Report* at the present time, but wishes the Council to be informed that the criticisms and suggestions of its Visitor and Inspector are under consideration, and will be taken into account when the Regulations of the First Examination next come before the College for revision.

I am, dear Sir,
Faithfully yours,
EDWD. LIVEING,
Registrar.

H. E. Allen, Esq.,
Registrar, General Medical Council.

(*b*) BY THE ROYAL COLLEGE OF SURGEONS OF ENGLAND.

The Council of the Royal College of Surgeons of England have carefully considered the *Report* of the Visitor and Inspector of the GENERAL MEDICAL COUNCIL, and have now to make the following comments thereon, viz. :—

The Syllabus, the Method, and the Standard of Examination in each subject are criticised by the Visitor and Inspector; and another matter which occupies much of the *Report* is a consideration of the way in which the Candidates have been taught.

The Visitor and Inspector have no fault to find with the status of the Examiners, with the discharge of their duties, or with the arrangements of the Examination.

They say as regards Biology :—"The arrangements of the Examination were admirable; there were plenty of specimens, microscopic and otherwise, and the questions put were well calculated to discover the knowledge or expose the ignorance of the Candidates so far as an Oral Examination is capable of achieving such ends" (p. 8).

And as regards Chemistry and Physics :—"We have seen the marks, read most of the papers, witnessed the Oral Examinations, the practical work and the marking of the results; and we do not think that any Examiners could carry out the Regulations with more scrupulous care, precision, and fairness than was observed at this Examination" (p. 15).

BIOLOGY.

The care taken by the Examiners and the impartiality of their decisions are acknowledged (p. 9), but the Visitor and Inspector declare their opinion (*Summary, p. 12) that the Examination is incompetent to determine whether a Candidate has prepared for the Examination by a hasty review of the subject, or has studied it thoroughly under a competent teacher. Yet, from the inspection of the Examination, in which they had no greater opportunities of observation than the Examiners, the Visitor and Inspector concluded that the Candidates were imperfectly trained. It is difficult to understand how the statement of the second clause of the *Summary* can be maintained if that of the first clause be correct.

---

* "*Summary*

"(i) Given the Syllabus and the method of conducting the Examination laid down for the Examiners, the conduct of the Examination is all that could be desired, and the standard exacted is apparently as high as can be obtained from Candidates so imperfectly trained as those at whose Examination we were present.

"(ii) The Examination is not capable of eliciting whether a Candidate has been properly taught or has been crammed, but this, in our opinion, is due to defects inherent in its method, and not in any way to the manner in which the Examination, as designed, is carried out."

1. *Syllabus.*

There is something to be said for curtailing the Syllabus (as, for instance, by omitting Vorticella, Spirogyra, and the Frog) and demanding a higher standard on the remaining portions (as, for instance, by laying special stress on the structure of the Dogfish as illustrating embryonic stages of the higher (Vertebrates).

On the other hand, the existing Syllabus was framed so as to make it parallel with that of the Preliminary Scientific Examinations in Botany and Zoology of the Universities, and especially of the University of London.

The object of the Conjoint Board in instituting an examination in Elementary Biology was to provide a general introduction to a subject in which the student, under the heads of Physiology, of Human Anatomy, of Pathology, and of Clinical Medicine and of Clinical Surgery, has afterwards to spend a great part of his time. For this purpose neither an extended syllabus nor a very severe examination is necessary.

The effect of more extended requirements would be to add to the student's knowledge of general Biology at the risk of delaying his entrance to those parts of the allied subjects which are more important to him, and which at the same time enforce to an equal degree scientific methods.

2. *Method of Examination.*

With respect to the remarks on pp. 8, 9, 10, and 12 of the *Report* :—

"Few, if any, seemed to have made, stained and mounted preparations for themselves, and some did not even know the names of the staining materials";

"We are inclined to think that better results would be obtained if a much more complete knowledge of two or three types, with their development and life-history, and a short Practical Examination on the preparation and staining of a microscopical specimen, were demanded, even if this involved, as it probably would, a curtailment of the Syllabus by the omission of some of the types now demanded."

". . . we might suggest that the cutting or at least the staining and mounting of a microscopic section would afford a considerable amount of information as to how a Candidate had been taught, and that such a test is one which might not unreasonably be demanded in an Examination of this character ;" it may be pointed out that slide-preparation is calculated to train the hand of the student rather than to inculcate a scientific mode of thought, the chief aim of the first year of study. The cutting of vegetable sections, necessarily by hand, as is well known to all who have taught the subject, requires for its accomplishment far more practice than can reasonably be expected of students who are unlikely ever again to adopt such a method ; while the preparation of animal tissues for microscopial examination constitutes a special department of the courses of Practical Histology and Pathology, to which the students have to devote much time during the succeeding years of their curriculum.

A practical Examination in Biology, unless of great length, and unless each Candidate is watched at work by an Examiner, is largely a matter of chance, as trifling accidents may spoil the final results of careful dissections or preparations.

The Visitor and Inspector (p. 11) find fault with the absence of a Written Examination, stating that, in their opinion, " it is not possible to judge whether the instruction which he (the Student) has received has been satisfactorily given." But in the next sentence they admit that, " within a certain scope of answers, an Examiner does find out whether a man knows anything or not better by an Oral than by a Written Examination." The advantages which they seem to attach to a Written Examination are that thereby a knowledge of principles can be better elicited, and that the methodical arrangement of a student's knowledge is thereby practised as early as possible in his career.

It is obvious that the Examination would be more thorough and searching if more time were devoted to it, and if a Paper were added to the Oral Examination. But, at the same time, we are of opinion that the requirements of the subject, so far as the Medical Student is concerned, are adequately met by the Examination as at present conducted.

So far as the knowledge of principles is concerned, we shall deal with the subject in the next section.

Some training in methodical arrangement and in clear and comprehensible exposition (see p. 11) is enforced at this stage of the student's career by the Written Examination in Chemistry; and these requirements are so constantly before the student in his subsequent studies, especially in Anatomy, that we do not feel the urgent necessity of giving them, however desirable in themselves, a leading position in the subject of Biology.

The Examiners of the Conjoint Board collectively report that they have personal knowledge of many different types of Biological Examinations, including those of Oxford, Cambridge, and London Universities, the Indian Civil Service, those for Entrance Scholarships and many others, and it is their deliberate judgment that the present mode of conducting the Examination is that most suited to the circumstances, and that it is particularly well adapted for "eliciting whether a Candidate has been properly taught or has been crammed" (p. 12, Summary, clause 2).

3. *Standard of the Examination.*

With regard to the statement on p. 10 that a "smattering of knowledge is all that students can be expected to have obtained," we would point out that the Visitor and Inspector fail to do justice to the value of Biology as a means of interesting students and of breaking in their minds to new methods. Elementary Biology is largely useful as an introduction to the methods of observation, which are the foundation of physical and natural science.

To impart to students the principles of a science is of little educational value unless the teacher can demonstrate to them that such principles are arrived at by a process of correlation of large masses of facts. To state a scientific principle as a dogma, and then to mention certain facts in illustration of the principle, is little calculated to make a student think for himself. An endeavour should be made to assist him in cultivating his powers of observation, and to show him how generalisations may be drawn from the facts he has himself observed, but as the facts which the student can observe for himself in the time given to Biology form but a slender basis for the deduction of its principles, it is preferable to lay less stress on those principles and to insist on laboratory work with its beneficial effect in training the mind.

The Visitor and Inspector (p. 9) state that they were informed that the occasion of their visit did not afford a favourable illustration of the average knowledge of Candidates. The period of the year at which this Examination was held should certainly be considered in reading their *Report.* Students who enter for the July Examination are often the least able and industrious members of the regular classes.

The Visitor and Inspector make the following important admission (p. 10) :—" *We have not been able to compare this Examination with any others of its own class, so that we are really contrasting it with an ideal standard existing in our own minds.*"

4. *The Candidates.*

The Visitor and Inspector (pp. 8 & 9) make depreciatory remarks about the Candidates, which seem beside the question of the efficiency of the Examination : for example, they " find it difficult to understand why some, the depths of whose ignorance were almost unfathomable, were ever allowed to present themselves for examination." The Board has no power to prevent a Candidate who has obtained the required certificate of attendance from presenting himself for examination when he pleases.

The Board gives the fullest possible opportunities to teachers of preventing incompetent students from presenting themselves for examination by requiring that students shall attend the various courses " to the satisfaction of their teachers. We believe that no other Examining Body has placed in the hands of the teachers so stringent a regulation.

CHEMISTRY AND PHYSICS.

The conduct of the Examination and the fairness of the Examiners are commended (p. 15).

The Syllabus, the details of the Paper, the plan of the first part of the Practical Examination are criticised, and the criticisms deserve consideration; but "the absence of any guarantee of sufficient preparation for the Examinations" has really nothing to do with the Examination itself.

1. *Syllabus.*

The following amended Syllabus of Physics, to which the Visitor and Inspector refer, and with copies of which they were furnished, had long been under consideration. It was adopted on July 31, 1902, and will come into force on May 1, 1903.

PHYSICS.

GENERAL PHYSICS.—Matter. Simple Substances and Mixtures. Properties of Solids, Liquids, and Gases. Solution. Diffusion. Dialysis. Osmosis. Specific Gravity of Solids, Liquids, and Gases. Atmospheric Pressure. Air- and Water-pumps. Syphon. Barometer. Boyle's Law.

HEAT.—Temperature. Thermometers. Expansion of Solids, Liquids, and Gases. Conduction, Radiation, and Convection. Calorimetry. Heat of Combustion. Specific and Latent Heats. Freezing Mixtures and Freezing Machines. Vapour Pressure. Boiling Point. Hygrometry.

LIGHT.—The action of the Prism and Lenses on Light. Reflection. Dispersion. The Spectrum. The Spectroscope.

ELECTRICITY.—Simple Forms of Batteries. Secondary Cells. Effects of Currents. Induced Currents and the Induction Coil. Electrolysis.

The Syllabus in Chemistry has been under consideration but its completion and issue have been delayed by the discussions in relation to the reconstitution of the University of London.

The remarks of the Visitor and Inspector on the Chemical part of the Syllabus contain some useful criticisms on details.

2. *Method of Examination.*

That the knowledge required for the separation of two salts is more than that required for the identification of a single salt is obvious; but it does not follow that in one case the Candidate must have a real intelligent knowledge, and in the other that his knowledge is acquired "in an empyrical and unintelligent way" (p. 18). In their remarks on page 17, the Visitor and Inspector appear entirely to misunderstand the object and rationale of Examinations. It is rarely possible to find out in an Examination all that a Candidate knows or all that he is ignorant of. The fact that he may be examined on any one of a large number of subjects compels him to become acquainted with the greater number of such subjects in order to secure the approval of the Examiners.

We are, however, of opinion that in view of the additions to the Schedule of Physics, it would be well to adopt the recommendation of the Visitor and Inspector that three questions on Physics should be included in the Paper.

3. *Standard, and* (4) *The Candidates.*

We have nothing to add to our comments under the heading of Biology, beyond pointing out that the observations of the Visitor and Inspector with regard to the percentage of marks (pp. 10 and 14) are applicable to nearly all Examinations.

According to the Regulations of the Conjoint Board four complete years must be spent in Medical Studies after passing the Examination in Biology, Chemistry and Physics. In drawing up Regulations and Syllabuses in these elementary subjects, the time which may be profitably spent in their study must be considered in relation to the whole medical curriculum.

At the present time the nominal five years' curriculum of the Board represents in fact a much longer period of study for the large majority of students, for out of 383 Candidates educated in the United Kingdom who obtained the Diplomas of L.R.C.P. Lond. and M.R.C.S. Eng. during the year 1901, only thirty completed their Examinations at the end of five years, whilst 139 spent between five and six years, and the remainder (214) more than six years in their Medical Studies.

The Royal Colleges have endeavoured, by encouraging the early commencement of Chemical, Physical, and Biological Study, to lead intending medical students to give as long a time as possible to those subjects. We are of opinion that the Visitor and Inspector are in error in supposing that the Examination is not sufficient for the purpose for which it is intended. This purpose is the testing of such knowledge of Chemistry, Physics, and Biology as a student may acquire in proper Laboratories and under sound teachers in the first year of his medical studies.

HENRY G. HOWSE,
President.

February 12, 1903.

REPORT

BY THE

EXAMINATION-COMMITTEE

ON THE

REPORT BY THE VISITORS OF THE EXAMINATIONS IN CHEMISTRY, PHYSICS, AND BIOLOGY OF THE CONJOINT EXAMINING BOARD IN ENGLAND.

MEMBERS.

Mr. BRYANT, Chairman.

Mr. YOUNG.	**Sir CHARLES BALL.**
Dr. HERON WATSON.	**Dr. LITTLE.**
Dr. McVAIL.	**Sir Wm. THOMSON.**

*** The Council will note that the observations received are solely from the Council of the Royal College of Surgeons. The Royal College of Physicians states that "the criticisms and suggestions of its Visitor and Inspector are under consideration, and will be taken into account when the Regulations of the First Examination next come before the College for revision."

The Visitation of the Conjoint Examining Board in England was held in July and August 1902, when there were 65 Candidates for the Biological part of the Examination and 109 for the part on Chemistry and Physics.

On the Examination of Elementary Biology of the Conjoint Board, the Visitors point out that "it is conducted entirely by the oral method, no paper being set and no practical work required from the Candidates" (p. 6).

Each Candidate at the above Board was under examination for fifteen minutes, and of the order and organisation and conduct of the Examinations the Visitors speak in high praise.

With respect to "the question as to whether the Examination was one by means of which it was possible to judge whether a Candidate had been properly prepared, with due attention to practical work, or whether his knowledge was merely the result of cram" (p. 11), the Visitors report: "That, in our opinion, under the system of submitting the Candidate only to an Oral Examination it is not possible to judge whether the instruction which he has received has been satisfactorily given"; and add: "We believe that a few questions to be answered in writing would be an addition of great value, and would materially assist in enabling a proper estimate of the Candidate's knowledge to be arrived at." The Visitors also express their opinion, "that the omission of any Practical Examination is a weakness in the particular instances we are considering" (p. 11), and add, however, that they "do not regard the written part as being of equal value with either the Practical or the Oral portions of an Examination on such a subject as Biology."

As a conclusion upon this part of the Examination the Visitors (p. 12) affirm: "That the Examination is not one capable of eliciting whether a Candidate has been properly taught or has been crammed," and that "this is due to defects inherent in its method."

In page 30 of the reply, dated February 12, 1903, of the Royal College of Surgeons, on the report of the two Visitors, it is stated as follows:—

"The Examiners of the Conjoint Board collectively report that they have personal knowledge of many different types of Biological Examinations, including those of Oxford, Cambridge, and London Universities, the India Civil Service, those for Entrance Scholarships, and many others, and it is their deliberate judgment that the present mode of conducting the Examination is that most suited to the circumstances, and that it is particularly well adapted for 'eliciting whether a Candidate has been properly taught or has been crammed.'"

The above is the collective opinion of the following gentlemen upon the Examination in Biology:—

Mr. F. G. Parsons.
Mr. H. Willoughby Lyle.
Mr. P. Chalmers Mitchell.
Mr. Walter G. Ridewood.

This COMMITTEE agree with the Visitors in the recommendation to add a written and practical part to the Examination in Biology.

The second half of the Visitors' work has reference to Chemistry and Physics.

This Examination was in all cases partly written and partly practical, and in some cases oral.

Three hours were allowed for answering from four to six questions—from a paper of eight set—but not more than six were to be attempted.

For the practical part of the Examination one simple salt or substance was given for analysis, and (p. 13) one simple salt was required to be made and shown up in characteristic form and good condition. Candidates were required to write an account of the work they had done.

The number of Candidates presenting themselves for Examination at the Conjoint Board was 109; 73 passed, and 36 failed.

Twenty-six had been previously examined.

Ninety-five of the Candidates came from Medical Schools, of whom 66 (or 69 per cent.) passed, and 29 (or 30·5 per cent.) failed. Fourteen Candidates came from other institutions, of whom 7 (or 50 per cent. passed).

An Oral Examination at the Conjoint Board was only given when a Candidate's written paper was rather weak, when he was examined in presence of two Examiners.

The Practical Examination at the Conjoint Board was, in the Visitors' opinion, well conducted. But the syllabus or synopsis is described by the Visitors as extraordinary, defective alike in matter and arrangement. It is divided into five sections: Physics, Inorganic Chemistry, Metals, Organic Chemistry, and Practical Chemistry (p. 15), but the Visitors add that next year an amended syllabus is to be adopted which meets many of their objections.

In order to make the Examination efficient, the Inspectors say it would be necessary to set three questions each in Physics, Inorganic Chemistry, and Organic Chemistry, and make it compulsory to answer two questions in each section.

The EXAMINATION-COMMITTEE approves of this recommendation.

The Visitors state that the Candidates were so badly prepared that a higher standard than the one used would have rejected the majority of them (p. 17), but as "the minimum 50 per cent. marks required on the average of the Written and Practical is higher than is usual in a Chemistry Pass Examination, the idea evidently of the Examiners is to make the questions easy and to require some of them to be answered well." This is a good principle, if the questions demanded were not so few, and contained so little of scientific principles that a Candidate might very well pass—and does pass—with only an empirical knowledge of a few preliminary facts crammed up from a book or a teacher, and with no understanding of elementary principles.

The Visitors likewise make suggestions as to improvements which are worthy of close attention.

The Visitors regard the standard as a low one.

This COMMITTEE concurs in this opinion, and refers the COUNCIL to the summary printed on page 19.

In answer to these criticisms of the Visitors, the remarks contained in the reply from the Royal College of Surgeons should be considered. The Visitors of this COUNCIL recognise the fact of the existence of the new syllabus of the Conjoint Board, which they admit meets many of their objections.

The Royal College of Surgeons adopts the recommendation of the Visitors that three questions in Physics should be included in the Paper, but are of opinion that the Visitors are in error in supposing that the Examination is not sufficient for the purpose for which it is intended (p. 33). They moreover point out that "in drawing up regulations and syllabus in elementary subjects, the time which may be profitably spent in their study must be considered in relation to the whole Medical Curriculum."

According to the Regulations of the Conjoint Board four complete years must be spent in medical studies after passing the Examination in Biology, Chemistry and Physics (p. 33), as well as five complete years of Medical study from the date of the Preliminary Examination in Arts. The purpose of the Preliminary Examination now under review "is the testing of such knowledge of Chemistry, Physics and Biology as a Student may acquire in proper Laboratories and under sound Teachers in the first year of his medical studies" (p. 33).

Under the present five years' curriculum, a much longer period of study for the large majority of students than one year is often occupied in acquiring and passing these preliminary subjects. During the year 1901, only thirty students completed their Examinations at the Conjoint Board at the end of five years, whilst 139 spent between five and six years, and the 214 remainder spent more than six years in medical studies.

In the *Report* of the Visitors the following statement is made: "We have not been able to compare this Examination with any others of its own class, so that we are really contrasting it with an ideal standard existing in our own minds."

It does not seem to the COMMITTEE possible, or even desirable, that an uniform system of examination can be adopted by all Licensing Bodies, for it is obvious that where several Examiners are engaged in each subject and those Examiners are changed from time to time, some will lay greater stress on one part of the Examination than another.

It should be conceded that not only a difference in method of examination must be recognised, but also a difference in standard. All University Examinations are not of the same standard, and if there be a variation of standard in Universities, variation will exist in regard to all Examining Bodies.

The EXAMINATION-COMMITTEE need hardly remind the COUNCIL that the primary Examination of this Board has been visited and reported on for the first time since the passing of the Act of 1886. The *Report* of the Visitors shows that the knowledge of the Candidates was low, that they were badly prepared, and that an adequate standard would have rejected the majority of them.

Finally, the COMMITTEE reports their agreement with the opinion of the Visitors that, as regards Biology, "the Examination is not one capable of eliciting whether a Candidate has been properly taught or has been crammed"; it also agrees that as regards the curriculum of the Colleges "the standard exacted is apparently as high as can be obtained from Candidates so imperfectly trained."

Concerning Chemistry and Physics the COMMITTEE agree with the Visitors that "the standard is a low one"; and that "the main portion of the Practical Examination is empirical and not scientific, and is no test either of sound principles or of practical efficiency."

THOMAS BRYANT,
Chairman.

May, 1903.

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